

Lake of the Woods Winter Creel Surveys: North/Central Sectors 1993–2002

NWSI Technical Report TR-132

September 2003



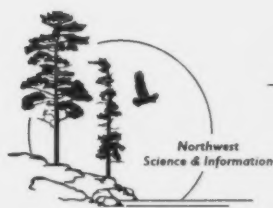
Lake of the Woods Winter Creel Surveys: North/Central Sectors 1993–2002

NWSI Technical Report TR-132

September 2003

by

T. Mosindy



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Abstract

Winter angling effort and harvest increased dramatically in the North and Central sectors between 1993 and 2002. Estimated effort more than tripled from about 21,962 rod-hrs in 1993 to 74,303 rod-hrs in 2002. Estimated harvest increased from 811 kg in 1993 to 11,824 kg in 2002. The largest increase in winter angling activity has occurred in the Central Sector. Resident anglers drawn from the Kenora area comprised over 95 percent of all anglers who were interviewed during winter surveys. Improved winter ice road access has also lead to increased usage of semi-permanent ice huts for angling. Walleye remain the target species of most winter anglers and account for over 54 percent of the total harvest. Angling catch (CUE) and harvest (HUE) rates for walleye of $0.277 \text{ fish}\cdot\text{rod}\cdot\text{hr}^{-1}$ and $0.111 \text{ kg}\cdot\text{rod}\cdot\text{hr}^{-1}$ remain lower than those reported during open water, although age and size of walleye in the angling catch were similar. Reported walleye release rates of 27 percent in 2002 were lower than those observed during open water. Although yellow perch and sauger are secondary species, there is a growing trend to angling specifically for yellow perch, especially in the North Sector.

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Disclaimer

The views, conclusions and recommendations are those of the author(s) and should not be construed as either policy or endorsement by the Ontario Ministry of Natural Resources.

Table of Contents

	Page
Abstract.....	iii
Acknowledgements.....	iv
Disclaimer	iv
List of Tables	vi
List of Figures	vii
Introduction.....	1
Methods.....	2
Results and Discussion.....	2
Effort.....	2
Harvest.....	4
Angling Success Rates	6
Angler Characteristics	7
Age and Size Compositions of the Harvest.....	9
Walleye	9
Other Species	10
Conclusions.....	11
Literature Cited	12

List of Tables

	Page
Table 1	3
A comparison of estimated angling effort (rod-hrs) by sector and period during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Table 2	4
Estimated angling harvest (kg) by species and sector during January to April, 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Table 3	6
A comparison of estimated CUEs (catch per unit effort as numbers of fish caught•rod-hr ⁻¹) by species, sector, and survey year during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Table 4	7
A comparison of observed HUEs (harvest per unit effort in kg•rod-hr ⁻¹) for walleye by sector, time period, and survey year during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Table 5	8
Percentage of fish in the angling catch reportedly released during January to April in 1993, 1994, 2001, and 2002, in the North and Central sectors, Lake of the Woods, Ont.	
Table 6	9
Number of semi-permanent ice fishing huts observed mid-month during January to March, 1993, 2000, and 2002, in the North and Central sectors, Lake of the Woods, Ont.	
Table 7	10
A comparison of the average weight (kg) harvested by species and sector observed in the angling catch during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont. Number of fish sampled appears in brackets.	

List of Figures

	Page
Figure 1	1
Location of Ontario sectors on Lake of the Woods.	
Figure 2	3
A comparison of estimated angling effort (rod-hrs) for the North, Central, and combined sectors during the period from January 1 to April 14 in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Figure 3	5
A comparison of estimated total angling harvest (kg) for the North, Central, and combined sectors during January to April 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Figure 4	5
Percent composition of the estimated angling harvest by species during January to April 1993–2001, from the North and Central sectors combined, Lake of the Woods, Ont.	
Figure 5	6
A comparison of the estimated angling harvest (kg) of walleye from the North, Central, and combined sectors during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.	
Figure 6	8
A comparison of residency and base of operations of interviewed anglers during winter creel surveys, 1993–2002 in the North and Central sectors, Lake of the Woods, Ont.	
Figure 7	9
Age composition of walleye sampled from angling catches during January to April, 1993, 2001, and 2002, in the North and Central sectors, Lake of the Woods, Ont.	
Figure 8	10
Age comparison of walleye sampled from North and Central sector angling catches during January to March in 2002, Lake of the Woods, Ont.	

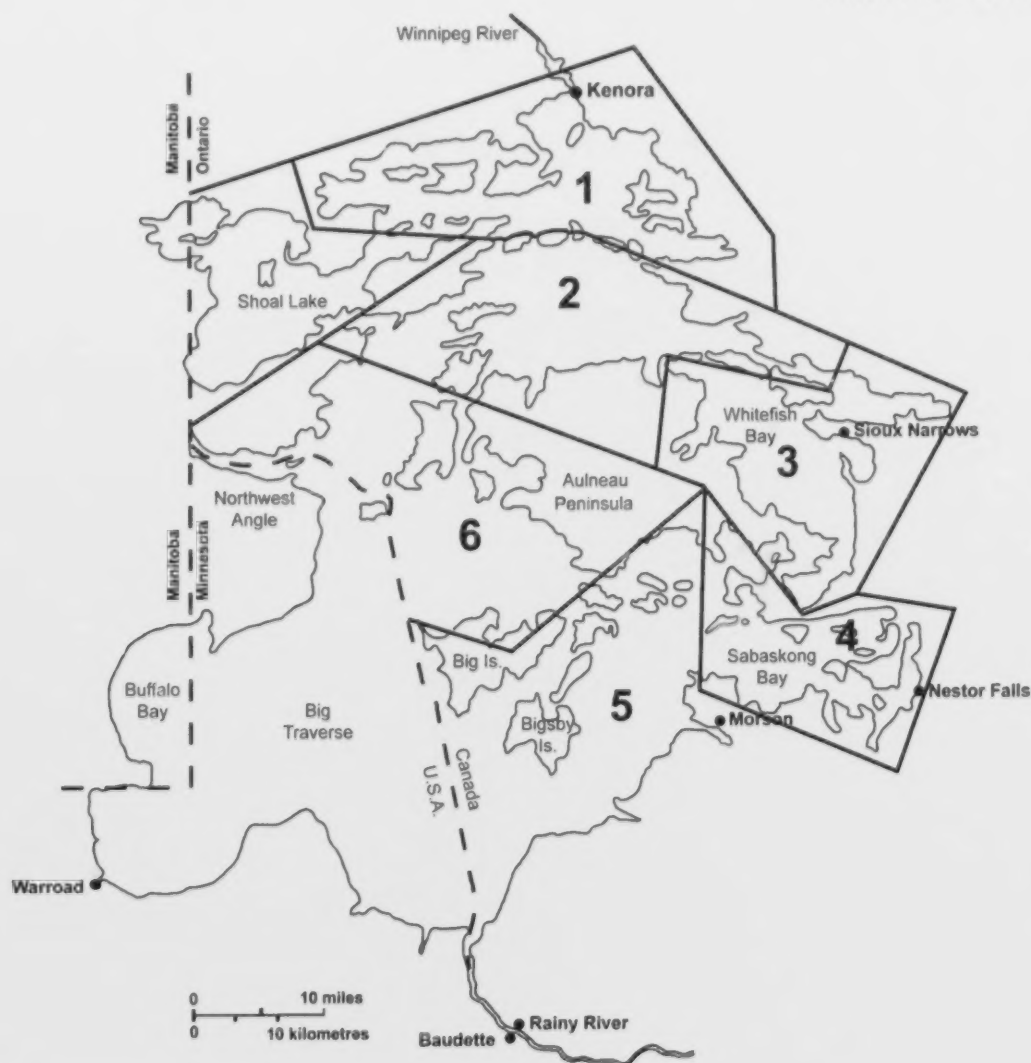


Introduction

Creel surveys were conducted on Sectors 1 and 2 (i.e. the North and Central sectors) of Lake of the Woods from January 1 until the end of the walleye angling season on April 14 during the winters of 1993, 1994, 2001, and 2002. Total angling effort and harvest, age and size compositions of the harvest, and angling success rates (catch-per-unit effort and harvest-per-unit effort) were estimated from survey information. In addition, the residency and visitor type (e.g. resort guest, cottage resident, daytripper, etc.) of anglers were recorded, along with the number and location of ice fishing huts during 1993, 2000, and 2002.

The North and Central sectors (29,450 and 40,300 ha surface area) are located immediately south of Kenora and encompass most of the lake north of the Aulneau Peninsula. Lake of the Woods has been arbitrarily divided into seven sectors (including Shoal Lake) for fisheries assessment purposes, based on observed differences in physical and chemical characteristics, fish communities, and user group patterns (Figure 1).

Figure 1. Location of Ontario sectors on Lake of the Woods.



Methods

The sampling survey design employed a roving creel survey model with equal probability sampling (Malvestuto *et al.* 1978). Data were analyzed using the two-stage method and FISHNET 2.0 (Lester and Korver 1996) to estimate angling effort, catch and harvest by sector, and by angling period. FISHNET was also used to analyze fish attribute data from the angling harvest.

Although both North and Central sectors were surveyed together, each sector was treated as a separate creel survey area after 1994. This reflects unique differences that were found to exist between these sectors and fulfills a survey requirement that creel crews be able to provide coverage of the entire area within a one-hour period for an instantaneous party count. Temporal stratification was employed. The creel survey period was divided into three distinct seasons based on previous survey observations: January 1 to 31, February 1 to 28, and March 1 to April 14 (the end of walleye angling season). Workdays (weekdays) and non-workdays (weekends and holidays) were surveyed separately. At least one workday and one non-workday were surveyed per week. Sampling days were randomly selected. Daily coverage ran for a 10-hour period from 0800 to 1800 hours. For the purposes of the 1993 and 1994 surveys, a day was divided into two time periods corresponding to observed differences in angling pressure during the openwater season: an a.m. period from 0800 to 1300 hours and a p.m. period from 1300 to 1800 hours. Later surveys did not employ daily stratification since it was found that most anglers were present throughout the day. Their activity could be adequately covered within an eight hour survey period beginning at either 0800 or 1000 hours. Starting times for daily surveys in 2001 and 2002 were randomly selected. Aerial frame surveys were conducted throughout the study period in each survey year and in 2000, to determine the spatial distribution of ice roads, ice huts, and angling activity.

Creel crews travelled from the Ministry of Natural Resources (MNR) base in Kenora by snowmachine and/or truck. They interviewed a subsample of anglers in each sector, proportional to the time available during each survey day. The total number of rod-hours, the residency of anglers, their visitor type, and base of operations (e.g. guest of a Canadian or American resort, cottager, etc.) were established. All fish kept by anglers were tallied and weighed by species. The total length and appropriate tissues for age interpretation (Mann 1993) were taken from a subsample of these.

A labour disruption by the Ontario Public Service Employees Union (OPSEU) on March 13 with the provincial government, terminated the 2002 survey earlier than expected. However, it was felt that estimates of angling effort and harvest for the remainder of the March to April period were consistent with observations made by survey crews during the first two weeks of March. Good ice conditions throughout these two sectors favoured ice fishing activity up until the walleye angling season closure on April 14 in all survey years.

Results and Discussion

Effort

A total of 154, 170, 272, and 326 angling parties were interviewed during January to April in 1993, 1994, 2001, and 2002, respectively.

Winter angling activity had increased significantly in both the North and Central sectors between surveys in 1993–94 and 2001–02 (Figure 2, Table 1).

Total angling effort for the combined sectors was estimated at 21,961 rod-hours, 31,418 rod-hours, 55,265 rod-hours, and 74,303 rod-hours in 1993, 1994, 2001, and 2002, respectively. While estimated effort more than tripled between 1993 and 2002, it also increased by over 34 percent between 2001 and 2002. Although creel data were not differentiated by sector in 1993 and 1994, the majority of angling activity was observed to occur in the North Sector (Greg Clark, MNR Kenora, *pers. comm.*). By 2001 and 2002 surveys, angling activity in the Central Sector had increased to where it was equal to or slightly greater than that observed in the North. While no consistent patterns in angling effort by season were observed, greater angling effort occurred on weekends and holidays than on workdays during survey years. Seasonal variability in effort probably reflects the influence of factors such as weather, ice conditions, etc. between years.

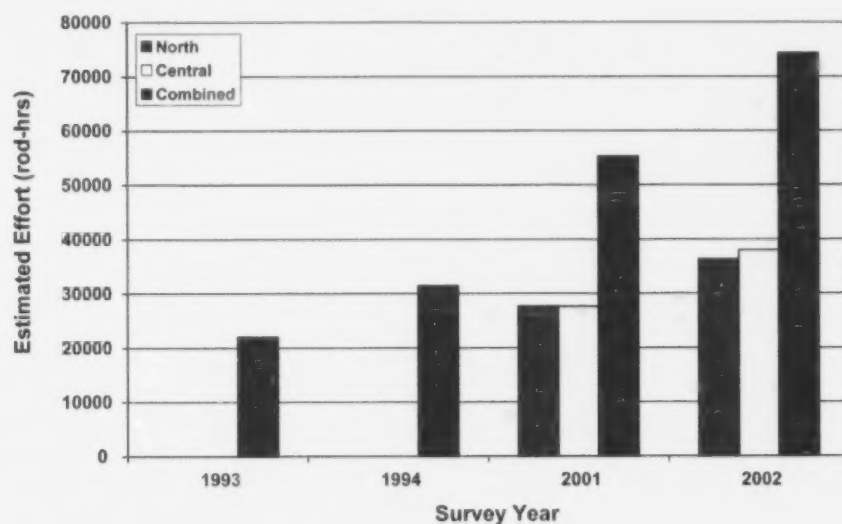


Figure 2. A comparison of estimated angling effort (rod-hrs) for the North, Central, and combined sectors during the period from January 1 to April 14, in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

Period	Year	Sector		
		North	Central	Combined
January–April	1993	n/a	n/a	21,962 ± 1,153.2*
	1994	n/a	n/a	31,418 ± 2,289.9*
	2001	27,665 ± 1,931.3*	27,600 ± 2,033.8*	55,265 ± 2,806.5*
	2002	36,330 ± 1,515.1*	37,973 ± 2,276.7*	74,303 ± 2,548.7*
January	1993	n/a	n/a	5,059
	1994	n/a	n/a	5,423
	2001	9,723	9,118	18,841
	2002	14,103	7,492	21,595
February	1993	n/a	n/a	4,778
	1994	n/a	n/a	6,403
	2001	7,046	8,079	15,125
	2002	14,268	15,542	29,810
March–April	1993	n/a	n/a	12,125
	1994	n/a	n/a	19,592
	2001	10,896	10,403	21,299
	2002	7,960	14,940	22,900

* ± 95% confidence interval

Table 1. A comparison of estimated angling effort (rod-hrs) by sector and period during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

Harvest

Total angling harvest for both North and Central sectors was estimated at 811 kg in 1993, 2,349 kg in 1994, 6,473 kg in 2001, and 11,824 kg in 2002 (Table 2, Figure 3). Estimated harvests for the period January to April increased by over 1,400 percent between 1993 and 2002; estimated harvest increased by over 82 percent between 2001 and 2002 alone. The North Sector accounted for the majority of effort and harvest in 1993 and 1994. In 2001, the Central Sector contributed over 60 percent of the total harvest from these sectors.

Table 2. Estimated angling harvest (kg) by species and sector during January to April, 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

Year	Species	Sector		
		North	Central	Combined
1993	Walleye			530.0
	Sauger			120.5
	Y.Perch			160.7
	Total			811.2
1994	Walleye			1,151.7
	Sauger			601.0
	Y.Perch			490.0
	N.Pike			66.0
	Burbot			40.0
	Total			2,348.7
2001	Walleye	1,270.0	2,803.2	4,073.2
	Sauger	192.0	496.7	688.7
	Y.Perch	1,066.7	271.3	1,338.0
	N.Pike	55.0	-	55.0
	Burbot	22.5	262.5	285.0
	L.Whitefish	33.0	-	33.0
	Total	2,639.2	3,833.7	6,472.9
2002	Walleye	2,672.6	3,715.3	6,387.9
	Sauger	760.0	522.0	1,282.0
	Y.Perch	2,213.0	926.2	3,139.2
	N.Pike	91.0	36.7	127.7
	Burbot	68.3	764.8	833.1
	L.Trout	53.9	-	53.9
	Total	5,858.8	5,965.0	11,823.8

Walleye (*Sander vitreus*) were the target species of most anglers and represented between 48 to 65 percent of the total estimated harvest from both areas in survey years (Figure 4). Walleye harvest increased from 530 kg in 1993 and 1,152 kg in 1994, to 4,073 kg in 2001 and 6,388 kg in 2002. More walleye were taken from the Central Sector than the North Sector in 2001 and 2002 (Table 2, Figure 5). Walleye also appeared to be more important in the Central Sector catch, representing between 62 to 73 percent of the estimated harvest, as compared to 45 to 48 percent in the North Sector fishery in the same years. Yellow perch (*Perca flavescens*) have increased in importance overall, from just over 20 percent in 1993 to 27 percent of the estimated harvest in 2002 (Figure 4). This species was more important in the North Sector where it has represented almost 40 percent of the estimated harvest in recent years. The relatively low incidence of yellow grub (*Clinostomum marginatum*) in perch in these areas has encouraged local anglers to overcome past prejudices concerning the edibility of this species. The representation of sauger (*Sander canadensis*) in the overall harvest has declined from about

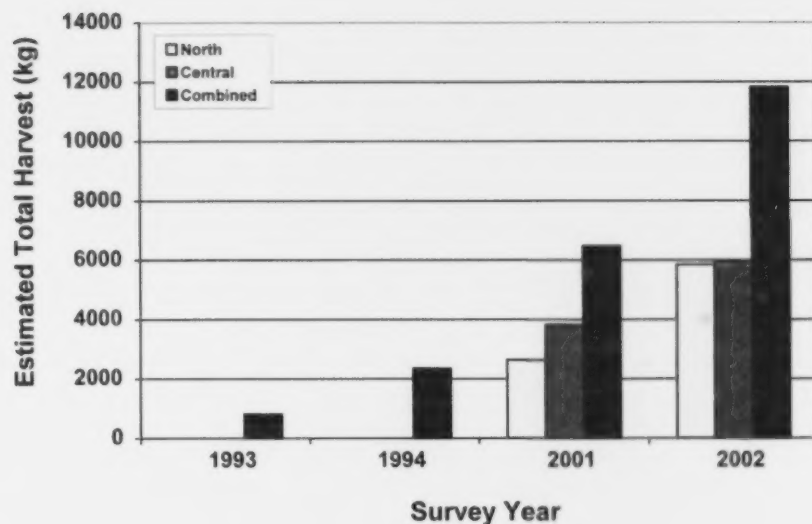


Figure 3. A comparison of estimated total angling harvest (kg) for the North, Central, and combined sectors during January to April 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

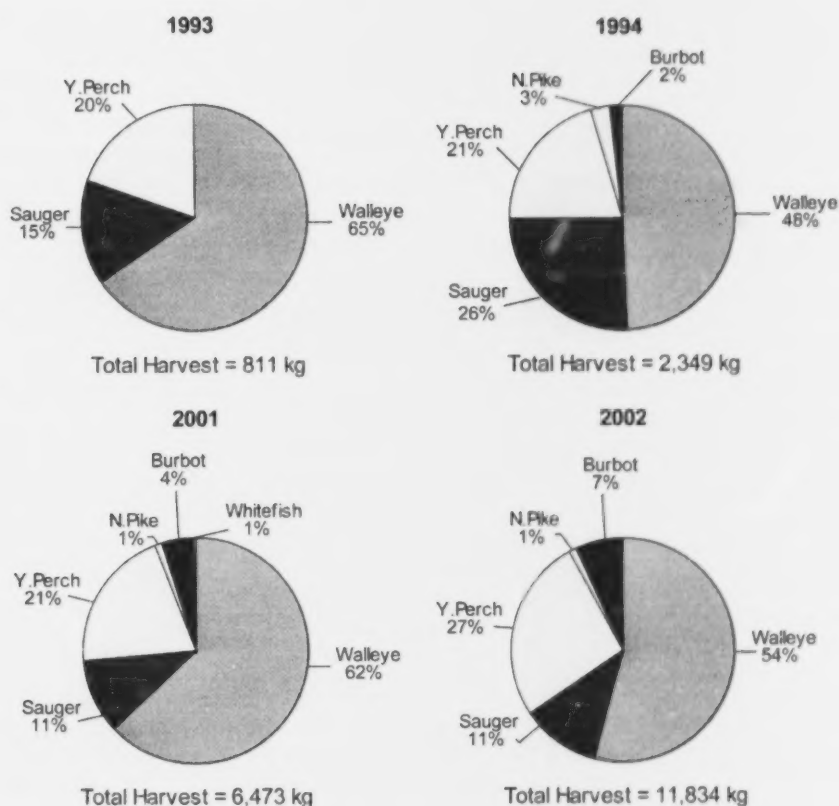
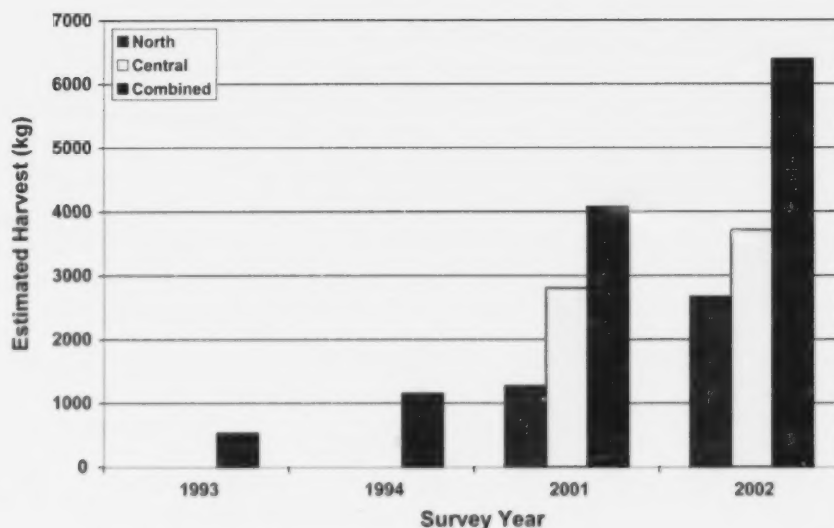


Figure 4. Percent composition of the estimated angling harvest by species during January to April, 1993-2002, from the North and Central sectors combined, Lake of the Woods, Ont.

15 percent in 1993 to less than 11 percent in 2001 and 2002 (Figure 4), although estimated harvest has increased from 121 kg to 1,282 kg during the same period (Table 2). This is in sharp contrast to the winter fishery on Minnesota waters of the lake where sauger are a primary species (T. Heinrich, Minnesota DNR, Baudette, MN, *pers. comm.*). More burbot (*Lota lota*) are being harvested by anglers in recent years, especially in the Central Sector. Although many are killed and left on the ice, increasing numbers of anglers

Figure 5. A comparison of the estimated angling harvest (kg) of walleye from the North, Central and combined sectors during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.



are keeping them to eat (G. Olson, MNR Kenora, *pers. comm.*) Northern pike (*Esox lucius*), lake whitefish (*Coregonus clupeaformis*), cisco (*Coregonus artedii*), lake trout (*Salvelinus namaycush*) and smallmouth bass (*Micropterus dolomieu*) are also caught incidentally by anglers but, are not major components of the winter harvest from these sectors.

Angling Success Rates

Both CUEs (number of fish caught, both kept and released per rod-hour) and HUEs (kg of fish harvested per rod-hour) for most species have steadily increased in both sectors during 1993–2002 surveys (Table 3 and 4).

Table 3. A comparison of estimated CUEs (catch per unit effort as numbers of fish caught·rod-hr⁻¹) by species, sector, and survey year during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

Year	Species	Sector		
		North	Central	Combined
1993	Walleye			0.039
	Sauger			0.019
	Y.Perch			0.031
1994	Walleye			0.118
	Sauger			0.039
	Y.Perch			0.075
2001	Walleye	0.125	0.280	0.203
	Sauger	0.022	0.068	0.045
	Y.Perch	0.240	0.130	0.185
2002	Walleye	0.226	0.325	0.277
	Sauger	0.053	0.050	0.051
	Y.Perch	0.342	0.167	0.253

Walleye CUEs for the combined sectors averaged 0.039 fish·rod-hr⁻¹ in 1993, 0.118 fish·rod-hr⁻¹ in 1994, 0.203 fish·rod-hr⁻¹ in 2001 and 0.277 fish·rod-hr⁻¹ in 2002. Corresponding HUEs were 0.024 kg·angler-hr⁻¹ in 1993, 0.038 kg·angler-hr⁻¹ in 1994, 0.096 kg·angler-hr⁻¹ in 2001 and 0.111 kg·angler-hr⁻¹ in 2002. Overall, walleye catch and harvest rates were lower than those observed during open water creels. Both CUEs and HUEs averaged 0.810 fish·rod-hr⁻¹ and 0.160 kg·angler-hr⁻¹ for the North Sector, and 1.075 fish·rod-hr⁻¹ and 0.179 kg·angler-hr⁻¹ for the Central Sector during the 2002 lake-wide creel survey (Mosindy

Period	Year	Sector		Combined
		North	Central	
January–April	1993			0.024
	1994			0.038
	2001	0.059	0.133	0.096
	2002	0.087	0.150	0.111
January	1993			0.019
	1994			0.043
	2001	0.09	0.216	0.152
	2002	0.086	0.240	0.128
February	1993			0.035
	1994			0.019
	2001	0.041	0.114	0.081
	2002	0.074	0.131	0.100
March–April	1993			0.022
	1994			0.055
	2001	0.049	0.084	0.064
	2002	0.094	0.089	0.091

Table 4. A comparison of observed HUEs (harvest per unit effort in kg·rod·hr⁻¹) for walleye by sector, time period, and survey year during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont.

2003). Similarly, walleye angling appeared to be better in the Central Sector than in the North Sector during the winter. On average, both CUE and HUE values for the Central Sector were twice as high as those observed for the North Sector fishery (Table 3 and 4). In contrast, angling CUEs for yellow perch were better in the North Sector than in the Central Sector, averaging 0.240 and 0.342 fish·rod·hr⁻¹ as compared to 0.130 and 0.167 fish·rod·hr⁻¹ during 2001 and 2002. A comparison of sauger catch rates revealed no obvious trends, outside of a slight increase in overall success over time.

Harvest success for walleye was highest during January in most years and declined throughout the season. This trend was most defined in the Central Sector fishery during 2001 and 2002 creel surveys (Table 4). This could indicate the “fishing down” of concentrations of fish at popular locations over the season and/or the failure of anglers to respond to seasonal movements of fish to other locations.

It would appear that anglers were less likely to release fish, especially walleye, from their catch during winter than during the open water season (Table 5). It was estimated that over 60 percent of walleye reportedly caught during the 1999 open water creel survey were released, as compared to 40 percent in 1992 and 36.6 percent in 1993 (Mosindy 2002). Anglers reportedly released between 13 and 28 percent of walleye caught during 1993–2002 winter surveys. Walleye release rates varied slightly by sector and increased between 1993 and 2002. A slightly higher release rate in 2002 may reflect the recruitment of a strong 1999 year class into the fishery. Most of these fish would have been less than 300 mm in length and too small to keep for many anglers.

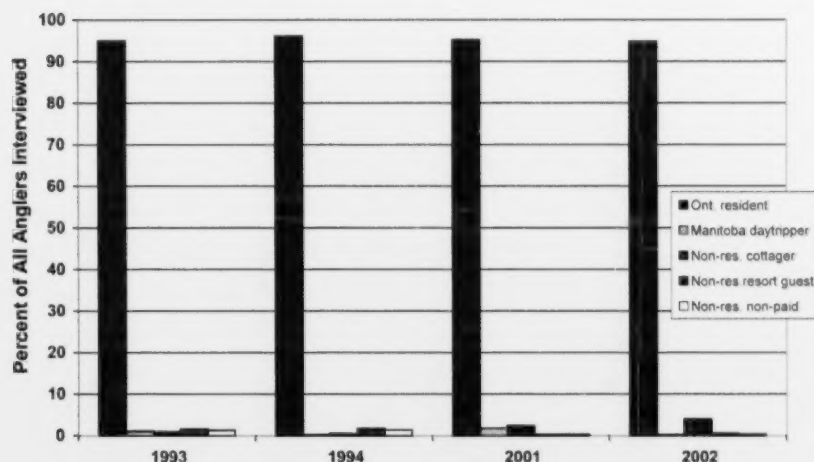
Angler Characteristics

Local residents of the Kenora area represented over 95 percent of all anglers contacted during 1993–2002 winter creel surveys. Cottage owners, primarily from Manitoba, represented the largest group of non-resident anglers (2 to 4% of the total) who were contacted. Non-resident daytrippers and resort guests comprised less than two percent of all anglers interviewed (Figure 6). This is

Table 5. Percentage of fish in the angling catch reportedly released during January to April in 1993, 1994, 2001, and 2002, in the North and Central sectors, Lake of the Woods, Ont.

Year	Species	Sector		
		North	Central	Combined
1993	Walleye			15
	Sauger			16
	Y.Perch			16
1994	Walleye			13
	Sauger			9
	Y.Perch			12
	N.Pike			0
	Burbot			0
2001	Walleye	27	22	24
	Sauger	10	17	16
	Y.Perch	43	66	51
	N.Pike	73		
	Burbot	76	33	45
2002	Walleye	28	27	27
	Sauger	20	21	20
	Y.Perch	37	43	39
	N.Pike	15	0	8
	Burbot	64	51	52

Figure 6. A comparison of residency and base of operations of interviewed anglers during winter creel surveys, 1993 - 2002, in the North and Central sectors, Lake of the Woods, Ont.



in sharp contrast to the 1999 open water creel survey (Mosindy 2002) where the majority of anglers interviewed were non-residents from the United States (83.7%) and from other Canadian provinces (7.5%), notably Manitoba.

Walleye were the target species of over 96 percent of all anglers contacted in either sector during all survey years. Yellow perch were the second most preferred species of anglers in the North Sector (46%) while sauger were the target of more anglers in the Central Sector (42%) during winter creels.

Along with an increase in effort and harvest, the popularity and use of ice huts, especially semi-permanent structures, grew significantly between winter surveys in 1993 and 2002 (Table 6). The total number of huts increased by over 400 percent during this period. Although increasing numbers are appearing in the Central Sector, most huts were observed in the North Sector during survey years.

Year	January		February		March–April	
	North	Central	North	Central	North	Central
1993	4	0	8	2	10	1
2000			12	12	8	5
2002	17	5	26	13	33	13

Table 6. Number of semi-permanent ice fishing huts observed mid-month during January to March, 1993, 2000, and 2002, in the North and Central sectors, Lake of the Woods, Ont.

Age and Size Compositions of the Harvest

Walleye

Age and size characteristics of walleye in the winter angling catch were similar to those observed during the open water season (Mosindy 2002, 2003). The majority of walleye sampled from angling catches during survey years were between three and six years of age (Figure 7), 300 and 400 mm in length, and 0.35 and 0.55 kg in weight (Table 7). Mean age of walleye in the angling catch declined from 4.86 years old in 1993 to 4.66 years in 2001 and 4.27 years old in 2002. This decline likely reflects the recruitment of a strong 1999 year class into the fishery in 2002. Walleye greater than or equal to 460 mm and greater than or equal to seven years old comprised less than

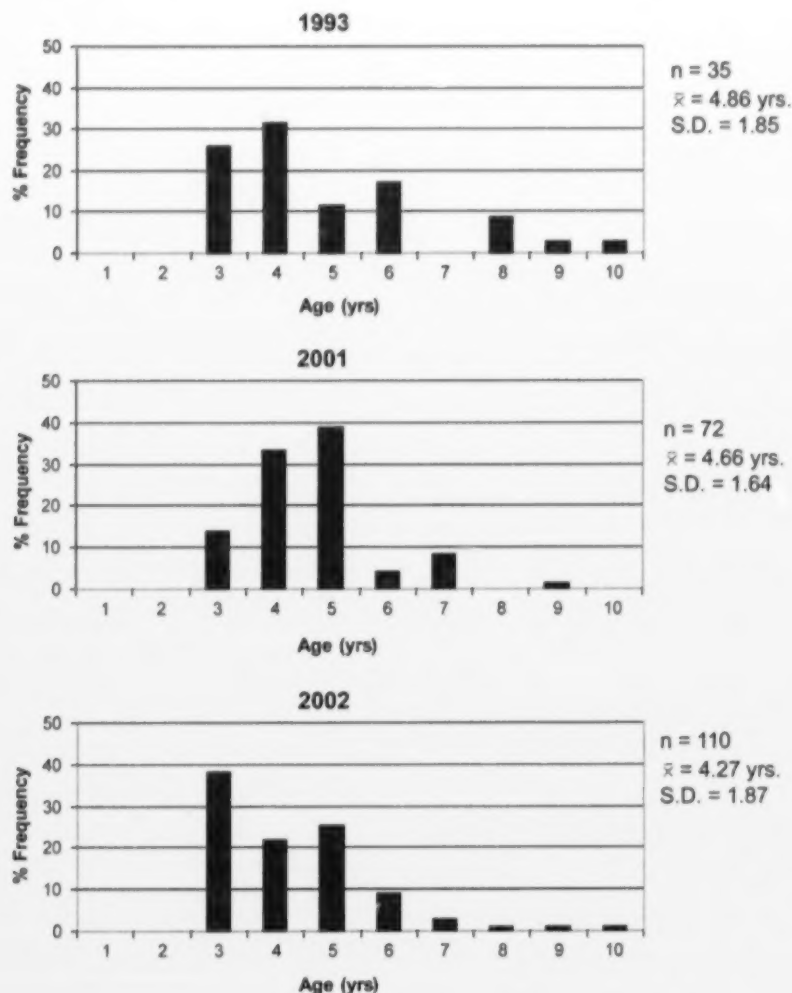


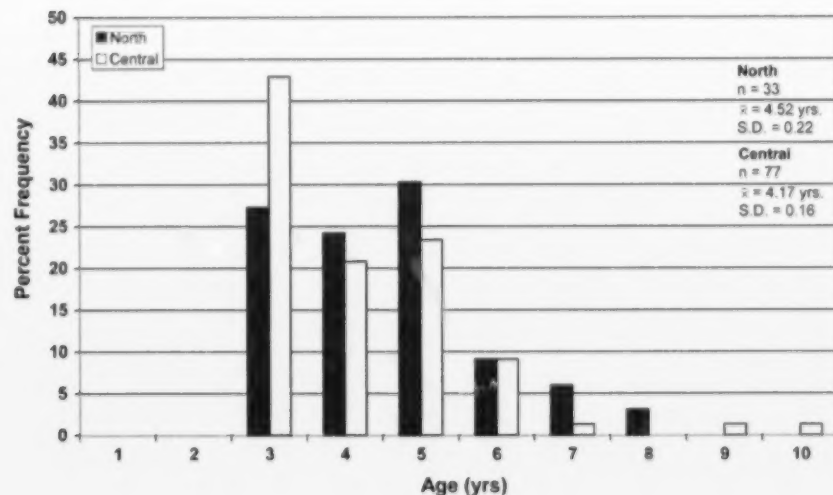
Figure 7. Age composition of walleye sampled from angling catches during January to April, 1993, 2001, and 2002, in the North and Central sectors, Lake of the Woods, Ont.

14 percent of the observed catch from both sectors in all years. Walleye in the North Sector catch tended to be slightly older and larger than those observed from the Central Sector (Figure 8 and Table 7).

Table 7. A comparison of the average weight (kg) of harvested fish by species and sector observed in the angling catch during January to April in 1993, 1994, 2001, and 2002, Lake of the Woods, Ont. Number of fish sampled appears in brackets.

Year	Species	Sector		
		North	Central	Combined
1993	Walleye			0.727 (43)
	Sauger			0.345 (74)
	Y.Perch			0.280 (45)
1994	Walleye			0.358 (155)
	Sauger			0.542 (69)
	Y.Perch			0.235 (70)
	N.Pike			1.500 (14)
	Burbot			0.700 (4)
2001	Walleye	0.504 (131)	0.465 (328)	
	Sauger	0.349 (33)	0.319 (96)	
	Y.Perch	0.284 (239)	0.220 (127)	
	N.Pike			1.100 (5)
	Burbot			1.500 (17)
2002	Walleye	0.450 (319)	0.414 (393)	
	Sauger	0.496 (33)	0.346 (51)	
	Y.Perch	0.283 (513)	0.255 (169)	
	N.Pike			1.467 (5)
	Burbot			1.750 (30)

Figure 8. Age comparison of walleye sampled from North and Central sector angling catches during January to March in 2002, Lake of the Woods, Ont.



Other Species

Sauger catches were dominated by fish four to eight years of age, 300 to 400 mm in length and 0.30 to 0.55 kg in weight. With the exception of 1993, few fish were observed older than age eight in the sampled catch.

Yellow perch catches were primarily comprised of fish six to 10 years of age, greater than or equal to 250 mm in length, and 0.22 kg in weight. Small sample sizes restricted age comparisons between survey years.

Conclusions

Both winter angling effort and harvest increased dramatically in the North and Central sectors between 1993/94 and 2001/02. Estimated effort and harvest more than tripled between 1993 and 2002. The Central Sector witnessed the greatest increase in angling activity during this period. Although the winter fishery accounted for less than 12 percent of estimated annual harvest and 12 to 15 percent of estimated annual effort in the North and Central sectors during 2002 (Mosindy 2003), it continues to grow annually and room for further expansion exists. Unlike the open water sport fishery which is dominated by non-resident anglers, the winter fishery in the North and Central sectors is almost entirely comprised of resident anglers drawn from the local Kenora area. Without increased tourism marketing and the establishment of commercial ice hut operations in these sectors, it seems unlikely that the demographics of this fishery will change in the near future.

Increased ease of travel, facilitated by the development of an extensive ice road network throughout these sectors, has been primarily responsible for the significant growth of the winter fishery. Although the ice road network is developed annually for purposes other than angling (e.g. direct road access for Northwest Angle First Nations residents to Kenora; cottage construction and access), anglers remain its primary users. Improved road access has also led to greater numbers and usage of semi-permanent ice huts for angling. Although ice huts have a long history of use on more southern waters in the province (e.g. Lake Nipissing and Simcoe) and on the Minnesota side of Lake of the Woods, it is only within recent years that they have gained popularity with local area residents. This trend is expected to continue.

Walleye were the target species of most winter anglers in the North and Central sectors, accounting for over 54 percent of the estimated harvest in 2002. Winter angling success rates for all species have steadily increased during the 1993–2002 study period but remain lower than those observed during open water. Angling catch (CUE) and harvest (HUE) rates for walleye averaged $0.277 \text{ fish}\cdot\text{rod}\cdot\text{hr}^{-1}$ and $0.111 \text{ kg}\cdot\text{rod}\cdot\text{hr}^{-1}$, as compared to $0.931 \text{ fish}\cdot\text{rod}\cdot\text{hr}^{-1}$ and $0.169 \text{ kg}\cdot\text{rod}\cdot\text{hr}^{-1}$ during open water in 2002 (Mosindy 2003). Both the age and size compositions of walleye in the angling catch were similar to those observed from these sectors during open water surveys (Mosindy 2002 and 2003). Anglers were less likely to release fish, especially walleye, from their catch during winter than the open water season. Anglers reported walleye release rates of 27 percent during the winter of 2002, as compared to 55 to 70 percent during open water surveys in 1999 and 2002 (Mosindy 2003). Although yellow perch and sauger are secondary species that are caught and kept incidentally, there is a growing trend to angling specifically for yellow perch, especially in the North Sector. Anglers have yet to realize existing opportunities for other species, especially lake whitefish, which are a mainstay of winter fisheries in other parts of the province.

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